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COMPLETE SPECIFICATION.

Means and Method for Cutting Rotating Rolls of Sheet Material.

We, LEVER BIAS MACHINE CORPORATION, whose full post office address is 120 West 31st Street, City and State of New York, United States of America, a Corporation organized and existing under the laws of the State of New York, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to apparatus and method for cutting through or slitting rotating rolls of sheet material, including thermoplastic, resinous or relatively hard material.

One object of the invention is to provide an improved and effective roll-cutting apparatus and method, by which rotating rolls of sheet material may be easily and rapidly cut through, the cut being clean and devoid of burrs, flashing and the like which could render the slit roll unsuitable for use or which otherwise would require subsequent finishing or qualifying operations prior to the material being put into use.

Another object of the invention is to provide an improved apparatus and method in accordance with the foregoing, which is simple to put into practice, the apparatus being simple to fabricate while at the same time reliable in operation.

Another object of the invention is to provide improved multiple means for cutting through rotating rolls of sheet material, which means is especially suited for use in automatic cutting or slitting machines by providing an effective and reliable dual-type cutting action which prevents fouling or jamming of the cutters, undesired melting of the sheet material when it is thermoplastic or the

like or other involvement which might interfere with the automatic operation of the machine.

A further object of the invention is to provide an improved roll cutting or slitting machine for use with sheet material, which machine is foolproof in construction and operation, involving relatively few components which may be readily fabricated and assembled.

Another object of the invention is to provide an improved roll slitting apparatus which is nevertheless economical to produce and manufacture.

In the drawings accompanying this Specification, similar characters of reference are used to designate like components throughout the several views, in which:—

Fig. 1 is a view partly in vertical section and partly in side elevation, showing the improved roll cutting or slitting means as provided by the invention.

Fig. 2 is a fragmentary front elevational view of one of the rotary cutting elements, together with the supporting and movement controlling means provided therefor.

Fig. 3 is a fragmentary sectional view through the cutter of Fig. 2, the section being taken on the line 3—3 of Fig. 1.

Referring to Figs. 1 and 2, the improved multiple-type roll slitting or cutting means as provided by the invention comprises essentially a pair of rotary cutters 10 and 12, said cutters being shown, for example, as arranged in opposite sides of a roll 14 of sheet material. The roll 14, as is usual, has a relatively thick tubular core member 16 through which there passes a spindle 18, the latter being part of an automatic roll slitting machine of one known type. All details of

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this machine are not given herein, since they are not necessary in order to understand and practice the present invention. Details of such machine may be found in co-pending Applications Nos. 3752/59 (Serial No. 863,518) and 38716/59 (Serial No. 865,176). Since the automatic machine, of which only a part is illustrated herein, is more fully described in the above Specifications, only those portions necessary for an understanding of the present invention will be described below.

The slitting machine has a bed or frame provided with rails or tracks 20 on which a carriage 22 rides, the said carriage being shiftable below the rotating roll 14 in directions axially of the said roll, whereby the latter may be traversed by a cutter mounted on the carriage.

As in the Specifications referred to, the automatic slitting or cutting machine has a powered cutter drive, this being associated with the rotary cutter 12 disposed over the carriage 22, such cutter being mounted on a spindle 24 supported by a pivoted "knife" arm 26 which latter is pivotally movable about an axis 28 carried by the carriage 22. The spindle 24 has a pulley 30 driven by a belt 32, the latter passing over a second pulley 34 which is affixed to a companion pulley 36, the pulleys 34 and 36 being turnable about the axis 28 of the knife arm 26. The pulley 36 is driven by a suitable belt 38 from an electric motor 40 which is carried by and swung under the carriage 22.

Advancing and retracting movement of the rotary cutter blade 12 with respect to the rotating roll 14 of sheet material is effected by a driving arm 42 and piston rod 44, the latter being connected with a piston and air cylinder assemblage 46 supplied with fluid through a line 48 from an electrically controlled valve 50 and fluid supply line 52. It will be understood that the above structure is such as to permit the rotary cutter 12 to be power driven by means of the motor 40 while at the same time the cutter may be advanced on the roller 14 of sheet material by effecting counterclockwise pivotal movement of the knife arm 26 by means of the cylinder 46.

In accordance with the present invention, novel plural cutter means which include the cutter 12 are provided for effecting a clean and quick slitting or cutting of the rotating roll 14 of sheet material. The said plural cutter means comprises the rotary cutters 10 and 12, said cutters being of different types, the cutter 10 having a pair of smooth cutting edges 54 and 56 as shown in Fig. 3 whereas the rotary cutter of knife 12 is serrated to provide a plurality of cutter elements or teeth 58.

Further, in accordance with the invention, the cutters 10 and 12 are caused to simul-

taneously advance and cut into the rotating roll 14 of sheet material. The mechanism by which advance of the rotary cutter 12 is effected has already been described above. The double-edged cutter or knife 10 is carried by a spindle 58 mounted on a pivoted arm 60, said arm being carried by a pivot pin 62 supported by a bracket 64 secured to the carriage 22. The knife mounting arm 60 has an extension 66 disposed below the pivot pin 62, said extension being adjustably secured to a sector plate 68 by means of a bolt 70 and the plate 68 having a depending actuating arm 72 pivotally connected to a piston rod 74 of a pivotally mounted cylinder-and-piston assemblage 76. The cylinder-and-piston assemblage 76 is connected by a fluid line 78 with the fluid line 48 supplying the piston-and-cylinder assemblage 46. Thus, both said assemblages will be activated and driven in response to operation of the electrically controlled valve 50 as may be readily understood. Operation of the piston-and-cylinder assemblage 76 will effect an advancing clockwise pivotal movement of the depending arm 72 together with the knife arm 60, thereby causing advance of the cutter 10 on the rotating roll 14 of sheet material. By suitable adjustment effected at the sector plate 68 by means of the bolt 70, the advanced and retracted positions of the cutter 10 may be altered. An adjustable stop bracket 80 is provided, having a stop pin 82 engageable with the knife arm 60 for the purpose of limiting the inward advancing movement of the knife 10. The bracket 80 is adjustably mounted on the carriage 22, as shown.

The cutter 10 is in the form of a disk having an annular V-groove 86 in its periphery, by which the two smooth cutting edges 54 and 56 are formed. It will be seen that the said groove provides sloping inner walls on the cutters 54, 56 and that the outer or remote walls of said cutters correspond to the two opposite faces of the cutter disk 10.

The milling type cutter 12 having the teeth 58 is so arranged that the teeth engage and cut away that portion of the rotating roll 14 of sheet material which is located between and is slit by the two smooth cutting edges 54 and 56.

According to the present invention the relative position of the cutters 10 and 12 may be so adjusted as to cause one or the other to initially engage the rotating roll 14 of sheet material. Where resinous material such as thermoplastic material is to be cut it is preferable to cause the cutter 10 to engage the sheet material in the first instance to provide for the cut hereinbefore described. In this operation as the knife 10 advances into the rotating roll of sheet material 14 it will encounter resistance mainly from the thin narrow ribbon of sheet material which has

been slit and which lies between the cutting edges 54, 56. However, as this thin narrow ribbon of material is removed by the teeth 58 of the second cutter 12, the resistance to advance of the smooth-edged knife 10 is removed, and accordingly the said knife therefore continues its advance. Also, due to the fluid interconnection between the piston-and-cylinder assemblages 46, 76 any increase in resistance to advancing movement suffered by one of the cutters 10, 12 will result in the other cutter continuing advance at an accelerated rate, and this acting on the roll 14 and cutting away the material thereof faster has the effect of lessening the load resistance offered to the first cutter. Accordingly, it has been found that a balanced action is had by virtue of the fluid interconnection of the piston-and-cylinder assemblages, by which a satisfactory, effective and clean slitting or cutting of the rotating roll 14 is insured.

It will now be seen that the method of cutting through the roll 14 as provided by the invention embraces the slitting of the roll by the smooth cutting edges of the first cutter 10 and the removing of slit material by the toothed cutting edges of the second cutter 12.

Where relatively hard sheet material is to be cut the adjustment is made so that the cutter 12 initially engages the rotating roll making the initial cut. In this operation the knife 10 engages the material slightly thereafter providing for a clean cutting effect.

It will be understood from the foregoing that there has been provided by the invention an effective means by which rotating rolls of sheet material may be cleanly cut through without causing burrs, flashing or the like, and that such cutting may be effected automatically in a known type of automatic cutting or slitting machine with but little modification thereof. The apparatus by which the said cut is effected is simple, involving relatively few components, and has been found to be reliable in operation at all times.

Upon the cutting through of the roll 14 being completed, suitable control means are activated to cause a withdrawal of the cutters 10, 12 by appropriate means which relieves the fluid force on the piston-and-cylinder assemblages 46, 76.

Withdrawal of the cutting element 10 may be utilized to initiate an indexing or shifting movement of the carriage 22, as by the provision of a microswitch 90 mounted on the carriage 22 and adapted to be actuated by a finger 92 carried by the plunger 74.

It will be understood that while the means for moving the knives into position to cut through the sheet material have been described in detail, such description is merely for exemplary purposes and should in no way be interpreted as a limitation. The

present invention provides a new and novel method for efficiently cutting through sheet material by means of the cutting arrangement described and has within its purview the utilization of any means which will effect the substantially simultaneous actuation of the cutting knives no matter where positioned in relation to the sheet material and no matter how driven, whether by mechanical, electrical or any other means as well as the fluid actuation described in detail heretofore.

#### WHAT WE CLAIM IS:—

1. Means for cutting rotating rolls of sheet material, comprising a pair of rotary cutters, power means for driving one of said cutters; means for mounting and rotating a roll of sheet material adjacent the said cutters; and means for effecting simultaneously relative advance of the cutters into the said rotating roll of sheet material, said cutters being of different types, one of said cutters having a smooth cutting edge and the other of said cutters having a serrated cutting edge.

2. Means as defined in Claim 1 in which one of said cutters has a pair of axially spaced smooth circular cutting edges the spacing of said edges determining the width of the cut made in the roll of sheet material.

3. Means as defined in Claim 2 in which one of said cutters comprises a disk having an annular V-groove in its periphery, the side walls of said groove forming the two spaced smooth cutting edges.

4. Means as defined in Claim 1 in which one of said cutters has a plurality of teeth disposed about its periphery, said teeth being so located as to engage the roll of sheet material at one side of the slit in said roll made by the smooth cutting edge of the other cutter.

5. Means as defined in Claim 4 in which one of said cutters has a pair of spaced smooth cutting edges positioned to straddle the zone of the roll of sheet material which is engaged by the teeth of the other cutter.

6. Means as defined in Claim 1 in which the means effecting simultaneous relative advance of the cutters comprises devices mounting the said cutters for advancing and retracting movement with respect to the roll of sheet material.

7. Means as defined in Claim 6 in which the means for mounting and rotating the roll of sheet material disposes the roll between the said pair of rotary cutters.

8. Means as defined in Claim 6 in which there is a carriage movable axially along the said roll of sheet material, and in which the devices mounting the cutters are both carried by the said carriage.

9. Means as defined in Claim 6 in which the means for effecting simultaneous rela-

tive advance of the cutters includes actuated pistons associated respectively with the mounting devices for the cutters, and includes a common source of pressure, for the said cylinders.

10. Means as defined in Claim 1 in which the means effecting simultaneous relative advance of the cutters includes means movably mounting the cutter having the smooth cutting edge, for advancing and retracting movements, and in which there is an adjustable stop means associated with the cutter having the smooth cutting edge, to limit the extent of full advance of the said cutter.

11. The method of cutting through a rotating roll of sheet material, which includes the steps of slitting the material with a cutter having a smooth cutting edge as the roll is rotating, and simultaneously, or substantially simultaneously, removing the slit material at one side of the slit with a serrated cutter.

12. The method of cutting through a rotating roll of sheet material, which includes the steps of slitting the roll with a cutter having smooth cutting edges at two closely axially spaced locations, and simultaneously, or substantially simultaneously, removing the sheet material between the slits with a serrated cutter.

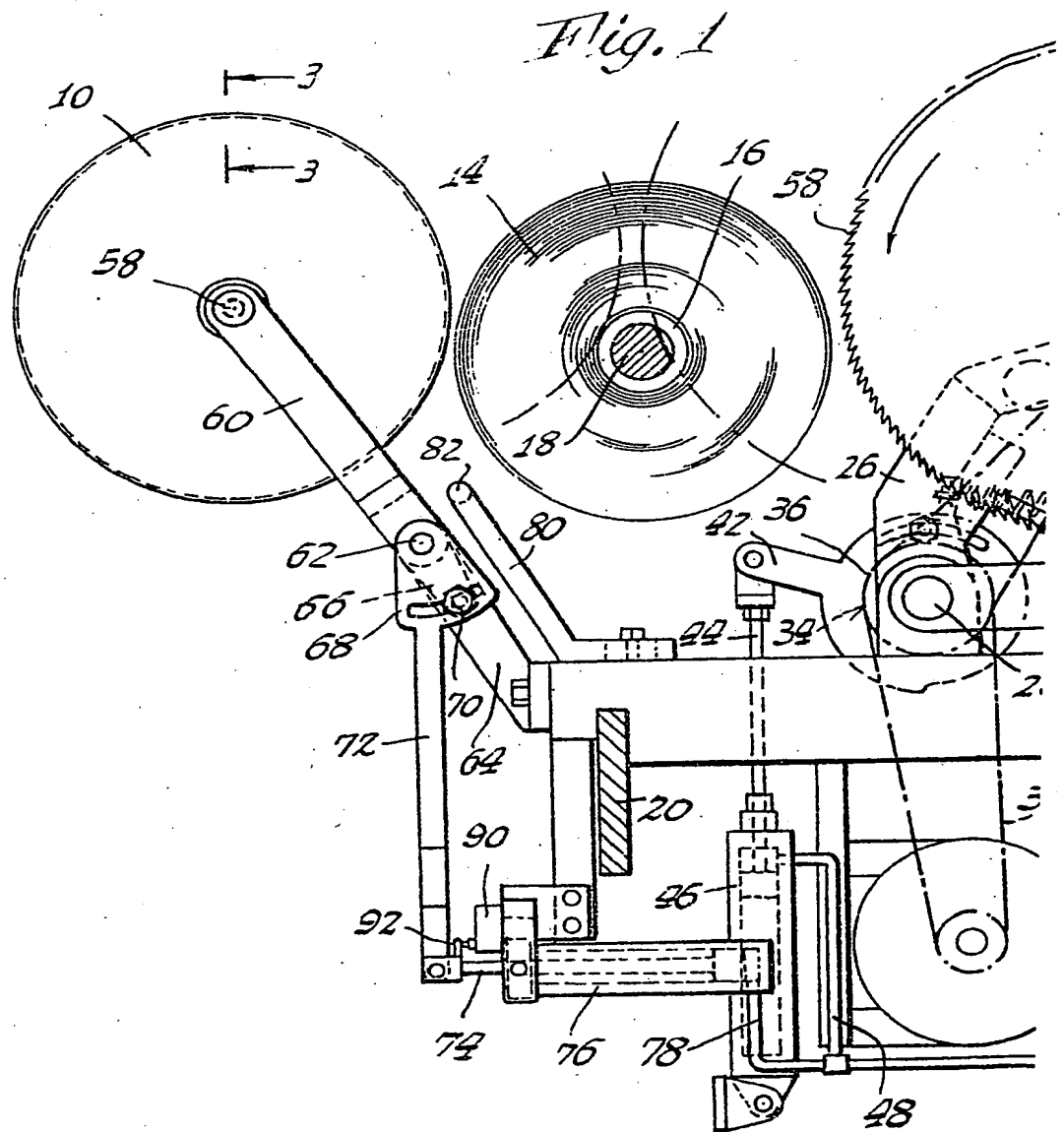
13. The method of cutting through a rotating roll of sheet material, which includes the steps of slitting the roll with a serrated cutter and simultaneously, or substantially simultaneously, slitting the roll with a cutter having smooth cutting edges at two closely axially spaced locations.

14. Means for cutting rolls of sheet material substantially as illustrated and described.

#### MARKS & CLERK.

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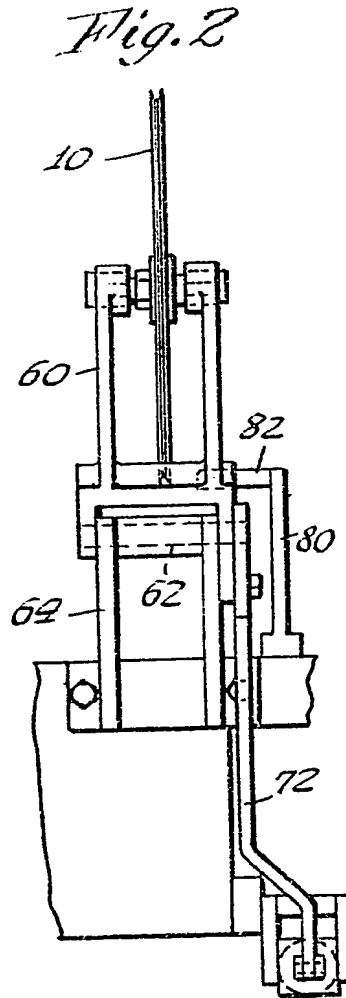
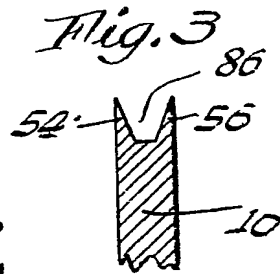
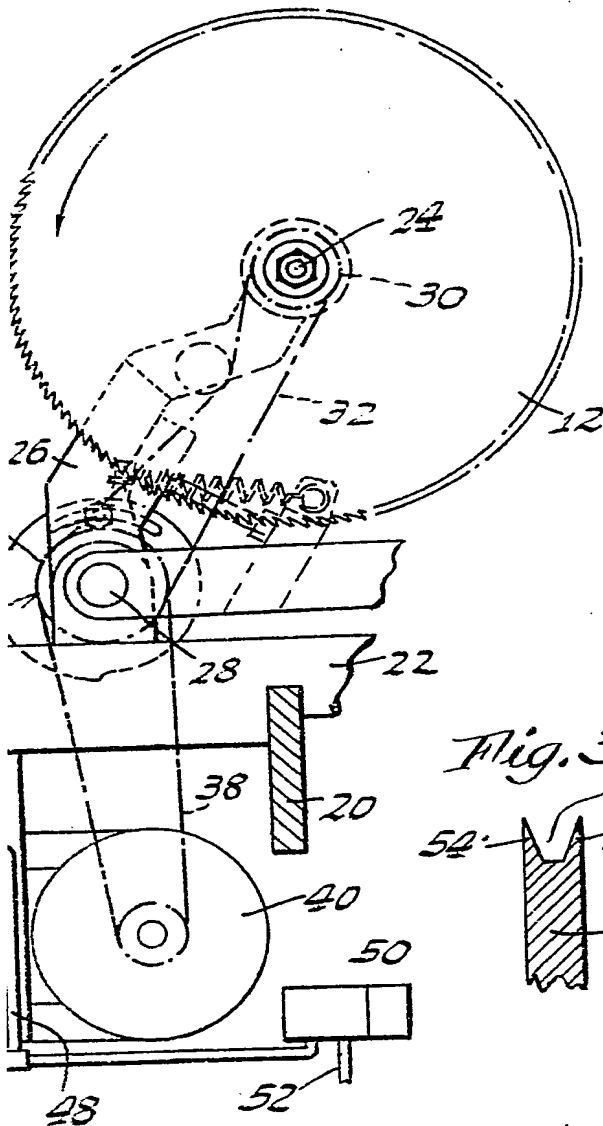
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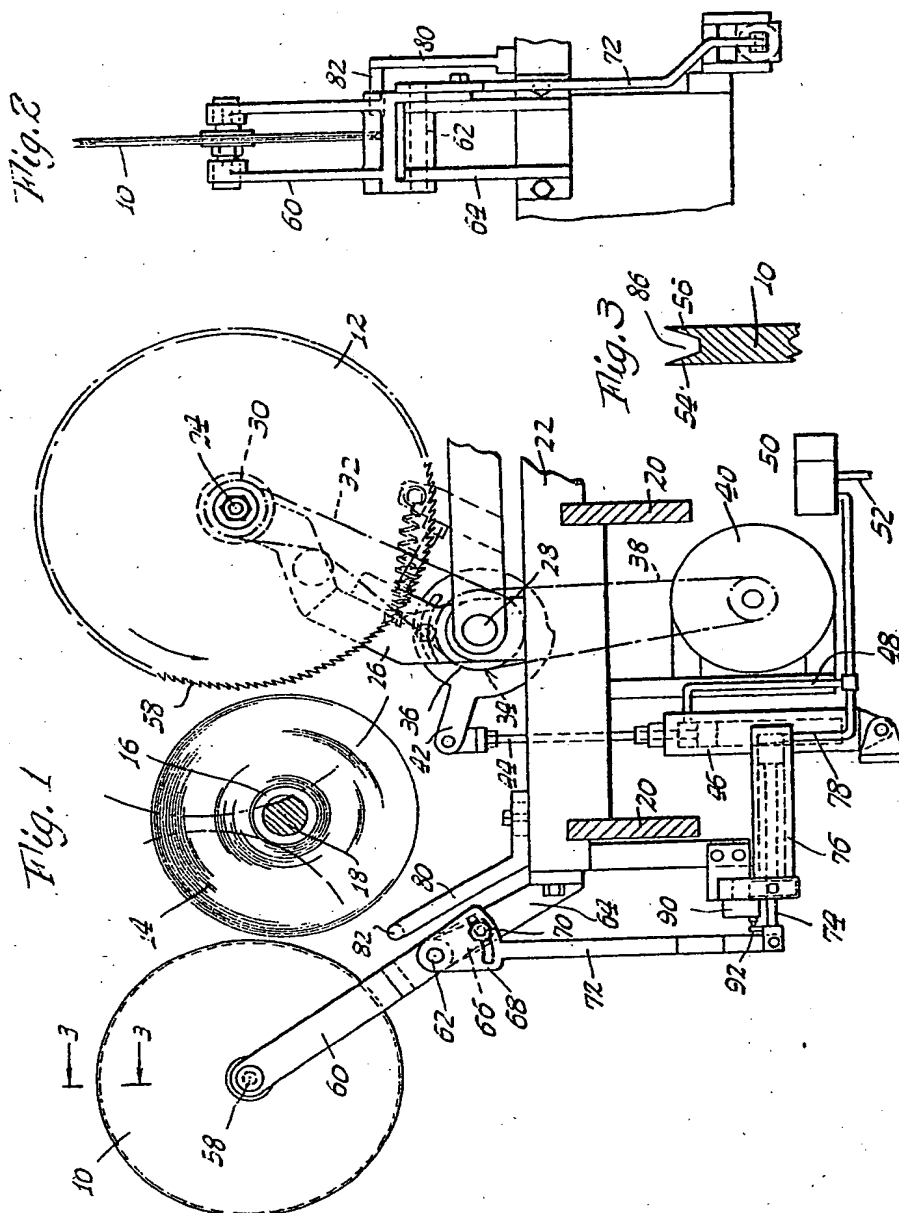
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